PRO-STAR
MICROPROCESSOR-BASED PROGRAMMER/CONTROLLER

PRO-8
MICROPROCESSOR-BASED CONTROL

PRO-SET
DIGITAL INDICATING CONTROL

PRO-TEMP
MICROPROCESSOR-BASED CONTROL

TOUCH-MASTER
DIGITAL READOUT CONTROL

TEMP-MASTER
SOLID-STATE CONTROL

FRICTION-AIRE®
PATENTED
OVENS

STABIL-THERM®
UTILITY OVENS

ULTRA-TEMP®
OVENS

MASTER/HEAT™
OVENS

Humid-Flow®
PATENTED
AIR-COOLED
TEMPERATURE/HUMIDITY CABINETS

Magni Whirl®
PATENTED IN U.S.A. AND CANADA
CONSTANT TEMPERATURE BATHS

vapor-temp®
PATENTED
CONTROLLED HUMIDITY CABINETS

Constant-Flow®
PATENTED
PORTABLE COOLING UNITS

VERSA-RANGE®
REFRIGERATED TEST CHAMBERS

Lab-Heat
LABORATORY MUFFLE FURNACES

VERSA-Whirl®
CONSTANT TEMPERATURE BATHS

Stabil-Glow®
FURNACES

RAD-O-GLOW®
FURNACES

DC-366SF

MODEL NO. DC-366SF

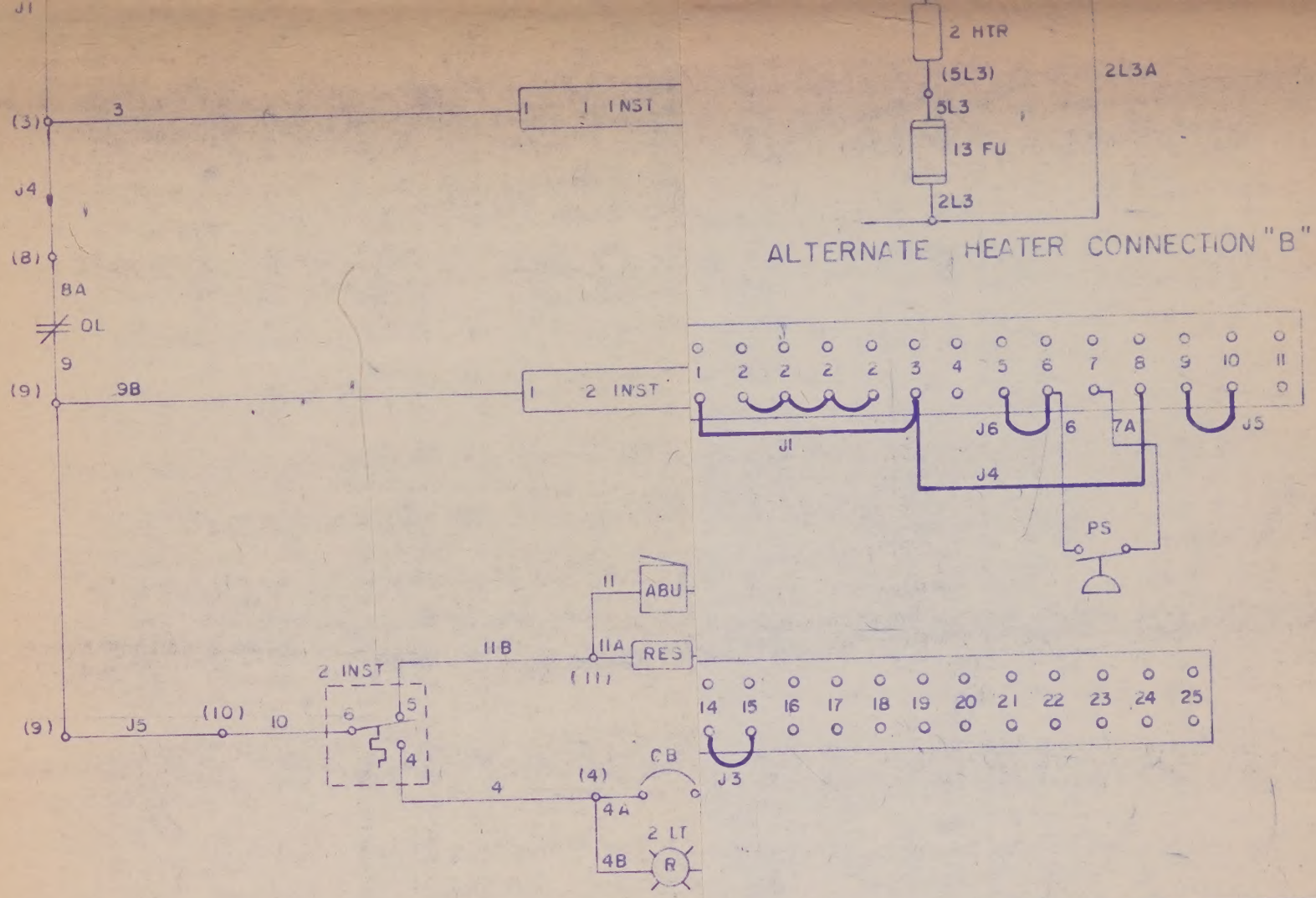
VOLTAGE 208-240V/3PH/60HZ

SERIAL NO. DC-3166

Read these instructions carefully before operating unit. Have them handy for ready reference at all times.

CONSTANT TEMPERATURE CONTROLLED EQUIPMENT TO +3000°F. (+1650°C.)

BLUE M
A UNIT OF GENERAL SIGNAL
BLUE ISLAND, ILLINOIS 60406
PHONES: (312) 468-7755 385-9000 TWX: 910-689-3398
Designers and Manufacturers of
ELECTRIC OVENS, BATHS, ENVIRONMENTAL CABINETS, FURNACES, INCUBATORS, REFRIGERATED UNITS, AND ACCESSORIES



BLUE M — A UNIT OF GENERAL SIGNAL			BLUE ISLAND, ILLINOIS 60406
PART NAME: WIRING DIAGRAM			
USED ON: DIGITAL CONTROL SERIES - 3 PH			
SCALE: —	DATE: 2-17-86	DRAWING NO: WD-998	REV: A
DRAWN: G.B	CHKD: JZ	APPR: WS	

F-291

BLUE M

A UNIT OF GENERAL SIGNAL
BLUE ISLAND, ILLINOIS 60406

MODEL NUMBER DC-366F . RI
VOLTAGE 208,240V/3PH/60HZ
MAX TEMPERATURE 316°C (600°F)
HEAT WATTS 13.5, 18.0 KW
INTERIOR DIMENSIONS 36W x 36D x 48H

PWD 205E-998-1A

THIS PARTS LIST TO BE USED WITH WIRING DIAGRAM WD 998A

Parts shipped F O B Blue Island, Illinois — When ordering parts, give Model No., Serial No., Voltage and Part No.

*PARTS NOT SHOWN
**OPTIONAL ACCESSORIES

ITEM	DESCRIPTION	PART NUMBERS	REQ'D
ABU	Alarm Buzzer-OTP	E01-1	1
CB	Circuit Breaker-OTP	C03C-4-1	1
1CON	Contactor-OTP	E02F-2-2	1
2CON	Contactor-Blower Motor	E02F-2-2	1
DISC	Disconnect Switch-Main	E16G-14	1
1-3FU	Fuse-Main (60 AMP)	E04C-60	3
4-6FU	Fuse-Blower Motor & Control Transformer (7 AMP)	E04M-7	3
7,8FU	Fuse	Not Required	
9FU	Fuse-Control Circuit (2.5 AMP)	E04J-2.5	1
10-15FU	Fuse-Heater	NOT REQUIRED	
1HTR	Heating Element (9.1 OHMS) (TWO 18.2 OHM IN PARALLEL)		
2HTR	Heating Element (9.1 OHMS) (TWO 18.2 OHM IN PARALLEL)	H45-0546-01	2
3HTR	Heating Element (9.1 OHMS) (TWO 18.2 OHM IN PARALLEL)		
1INST	Temperature Control-Main	C04B-5-03	1
2INST	Temperature Control-OTP	C03B-7-02	1
3,4INST	Heat Relay-Solid State	E02K-2-05	2
5INST	Heat Relay-Solid State	NOT REQUIRED	
LS	Limit Switch-Slide Tray Safety Interlock	E16H-9	1
1LT	Pilot Light-Main (Red)	E06B-9	1
2LT	Pilot Light-OTP (Red)	E06B-9	1
MTR	Motor-Blower (1 HP)	E10B-5-15	1
**	Motor-Blower (1 HP) (USE WITH STAINLESS STEEL WHEEL)	E10B-5-12	1

DC SERIES OVENS

1. ATTENTION - WARNINGS.....I-303-37
2. OPERATING INSTRUCTIONS.....I-106-10R3
3. UE TEMPERATURE CONTROLLER.....D930-4
4. UE OTP CONTROLLER.....IM-930-3
5. OTP INSTRUCTION.....I-206-1R2
6. ONE PASS AIR FLOW SYSTEM.....I-205-2R1
7. WIRING DIAGRAM.....WD-
8. WARRANTY/GUARANTEE.....304-6A
9. ELEMENT CLIP DRAWING.....I-302-53

3-PHASE UNITS

1. BLOWER ROTATION TAG.....I-303-17
2. IMPORTANT NOTICE FOR THREE PHASE OVENS.....I-200-1
3. 3-PHASE TAG.....I-302-15

RH: 8/25/86

*** * * * ATTENTION * * * ***

READ THESE IMPORTANT WARNINGS!

*** * * * * * * * * * * ***

HAZARD

THIS UNIT IS NOT INTENDED FOR USE IN PROCESSING HAZARDOUS WORK LOADS. FATAL INJURIES AND PROPERTY DAMAGE CAN RESULT FROM PROCESSING COMBUSTIBLE VOLATILE FLUIDS OR MATERIALS WHICH EMIT EXPLOSIVE VAPORS.

Consult with your safety engineering staff before processing questionable loads in this unit.

Blue M designs and manufactures other equipment for processing hazardous materials.

*** * * * * * * * * * * ***

CAUTION

This unit is equipped with OTP, overtemperature protection circuitry. This unit must be checked once a month to ensure it is performing according to design parameters.

TO TEST: Run operating temperature of chamber without a product load to a value above the OTP trip point, usually a value ten degrees above unit's normal maximum operating temperature. Lowering trip point to the temperature setpoint to create an alarm condition is NOT a valid test.

When plenum temperature reaches the OTP setpoint, chamber should shut down and cease operating if the OTP circuit is functioning properly.

After testing, chamber can be returned to normal operation by pressing the OTP reset button.

Refer to your unit's OPERATING AND MAINTENANCE Instruction for detailed information.

*** * * * * * * * * * * ***

DANGER!

THIS PRODUCT IS BUILT WITH DESIGNED-IN SAFETY FEATURES. ANY UNAUTHORIZED MODIFICATIONS OR COMPONENT CHANGES TO THIS UNIT COULD RESULT IN CONDITIONS LEADING TO PERSONAL INJURIES, PROPERTY DAMAGE, AND FATALITIES!

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CAUTION!

TO AVOID DAMAGE, THIS INSTALLATION ADJUSTMENT INSTRUCTION MUST BE FOLLOWED CAREFULLY.

INSTALLATION ADJUSTMENT

This unit is designed to operate from a wide range of power input voltages. To provide optimum internal control circuit operation, the secondary of the control circuit transformer (located on tray behind control panel) is provided with several adjustable taps and a double wound primary coil. Installing electrician must verify that this transformer has been connected for your actual power input voltage.

The transformer primary (Terminals H1, H2, H3 and H4) are connected for either 208-240 volts or 380-480 volts. These connections should not be changed as correction of such magnitude would also require power component replacement (heaters, motors, fuses and even wiring).

The transformer secondary (terminals X1, X0, X2 and X3) can and should be adjusted to provide a control operating voltage of 110 to 120 volts on 60 hertz units or 100 to 110 volts on 50 hertz units. Transformer terminal X1 is grounded to act as control circuit neutral and should not be changed, but wire connected to terminal X0, X2, or X3 can be moved to provide the control voltage closest to that listed above. Table on wiring diagram shows usual voltage connection, but it is recommended that an actual measurement of control circuit voltage be made at time of installation and tap adjustments be made to bring control voltage to above optimum value.

NOTE: NOT ALL TRANSFORMERS INCLUDE THE X0 TAP.

WS/AA/LV: 5/16/86

ADDENDUM

This information replaces the calibration discussion found in Section IV. MAINTENANCE under 2. CALIBRATION on Page 8.

CALIBRATION

Temperature controller will maintain set point temperature indefinitely. If control characteristics of chamber are inadequate, or when fully stabilized, setpoint and indicated temperature do not match, control can be tuned for your specific application.

Drop down small door at bottom front of controller. Inside you will see four tuning pots. From right to left they are identified as TIME, BAND, FINE and CRSE. These pots have been factory adjusted to provide optimum control characteristics at some midpoint temperature with unloaded oven and no exhaust (unless a specific exhaust was specified). Any major change in these conditions could warrant further tuning.

TIME - Controls cycle time of time proportioning control. TIME was factory adjusted by turning fully clockwise and then backing off less than 1/16 of a turn. This provides very short cycle time of approximately one second. No further adjustment should be required.

BAND - Controls proportional bandwidth. It was factory adjusted by turning fully counterclockwise then clockwise 1/4 of a turn. If chamber tends to overshoot setpoint temperature, turn pot further clockwise. If it does not get up to temperature fast enough, turn counterclockwise.

CRSE & FINE - These two pots control manual reset action of control. If control setpoint and stabilized indicated temperature do not agree, turn either pot clockwise to increase or counterclockwise to decrease chamber temperature. Action of both controls are the same. CRSE will provide large changes. Fine will make smaller changes. Make adjustments in small increments and allow at least 15 minutes between adjustments to allow chamber temperature to stabilize.

For further information, refer to control manufacturer's instructions included in your instruction package.

DC SERIES OVENS

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* Indicates where CAUTION notices are placed...**PLEASE READ THEM!**

BLUE M
A UNIT OF GENERAL SIGNAL

DC SERIES OVEN

I. INSTALLATION

A. UNCRATING

Carefully uncrate unit and all accessories. Visually inspect for any signs of damage from improper handling. Report all claims for damage to the carrier immediately. We will assist you with your claim, if requested. Please do not return goods without written authorization.

B. LOCATION

This unit will maintain temperatures within its range to close tolerances for extended periods without adjustment. Producing results compatible with this unit's capabilities requires reasonable care in choice of location.

Line voltage variations should be kept to a minimum for best control accuracy. Do not locate unit in areas of wide ambient temperature variation. While this oven will perform satisfactorily under less than ideal conditions, optimum control characteristics will be obtained if these variables are kept to a minimum.

C. POWER CONNECTION

Unit is furnished with a fused disconnect. Necessary information for sizing power lines and fusing appears on unit's data plate and wiring diagram/parts list. Fuse protection must never exceed 125% of unit's current rating.

CHAMBER MUST BE GROUNDED. This piece of equipment must be properly grounded before it is used. Consult the National Electrical Code and local codes for proper grounding. Also observe proper grounding technique to reduce RFI and EMI for electronic gear.

D. BLOWER ROTATION

Three phase ovens must be checked for proper blower rotation before use. Rotation is correct when a rapid movement of air can be felt from right side of chamber interior. Reversing any two of incoming power lines will reverse blower rotation. Check air flow both ways to determine which produces greatest air flow. See note on next page.

NOTE: Three phase units have as a safety feature, an air flow switch that has been installed in blower plenum of unit. This pressure switch is used to sense pressure differential created by blower. If air flow is not great enough, unit's heating elements will not energize. Incorrect blower rotation causes this condition.

II. OPERATING CONTROLS AND FEATURES

To obtain maximum performance from this oven, carefully read material contained in this section before attempting to operate unit.

A. MAIN SWITCH

This switch turns power On and Off to entire unit.

B. MAIN PILOT LAMP

Lights when unit is connected to a line source and main switch is On to indicate that power is applied to unit.

C. MAIN TEMPERATURE CONTROL

Controls On/Off function of solid state zero cross firing relays. They in turn control power to heating elements to maintain desired temperature setting.

To set temperature: Press knob on front of control. Digital display will indicate setpoint temperature. To raise setpoint, rotate knob clockwise while holding it depressed. To lower setpoint, turn knob counterclockwise. When knob is released, digital display will return to actual interior chamber temperature. For additional details see UE D931 manufacturer's instructions enclosed.

D. OTP (OVERTEMPERATURE PROTECTION) CONTROL

OTP control is a fully independent system with its own thermocouple. By its On/Off action, it will take over chamber temperature control if chamber exceeds OTP setpoint. Usually OTP will be set 10 degrees C above Main Temperature Controller. OTP Max-Set features time delay circuit which allows OTP control to cycle heat several times before it will trip out permanently requiring manual reset. For additional information, see Max-Set Instruction I-206-1R2 and OTP control's manufacturer's instruction (UE D931).

E. OTP RESET SWITCH

After OTP condition has been corrected, depressing button restores unit to operation.

F. CONTROL FAILURE PILOT LAMP

Lights after unit has shut down from an overtemperature condition and temperature has dropped.

The following electrical devices are located in control console. Refer to wiring diagram and parts list for additional information.

G. CONTROL CIRCUIT FUSE

Serves as a protection device for control circuit. If this fuse opens due to excessive current or a short, entire unit will shut down. Never replace this fuse with another which is greater than original rated amperage.

H. LINE FUSES

These fuses protect entire unit from excessive current and short circuits.

I. MOTOR OVERLOAD PROTECTION (THREE PHASE UNITS ONLY)

If motor starter overload overheats due to excessive current draw, motor overload relay will trip out and open OTP contactor which will in turn shut down entire unit with exception of main pilot lamp.

To restart unit, first remove power and loosen two screws at top corners of panel on back of unit. Drop panel down to gain access to overload relay. Depress white button on relay to reset contactor and restore power to unit. If relay continues to trip, have an electrician inspect unit to find source of trouble.

Motor heaters are heat sensitive and will trip for reasons other than a defective motor. Two common reasons for nuisance tripping are excessively high ambient temperatures and high line voltage. If line voltage is too high, current draw through motor will be increased. If this is the case, replace motor heater with one size larger. If relay continues to trip, it must be

assumed that there is a problem with motor.

If resetting motor overload does not return motor to operation, check three fuses adjacent to overload relay. These are provided to protect motor circuit wiring as well as control circuit wiring.

J. CONTROL PANEL INTERLOCK SWITCH (THREE PHASE UNITS ONLY)

This safety switch disconnects power from most exposed terminals within control compartment whenever panel is dropped for service. However, you should remove all power by pulling fused disconnect switch.

K. ALARM BUZZER

Sounds when unit has shut down from overtemperature condition.

L. ONE PASS AIR FLOW SYSTEM

This system allows you to open a damper to adjust air intake and exhaust. The more you open it, the more ambient air gets in to mix with internal recirculate air. One Pass damper is closed for full recirculation of air, contributing to good temperature uniformity, and better economy. However, it may be left open for better temperature control near ambient temperature, to provide a slow cool down so as not to shock a sensitive work load to cooler outside air, and as a temporary duct for connections to the work load. Finally, it may be kept open to exhaust vapors.

CAUTION

VENTING VAPORS DOES NOT CONVERT UNIT INTO A HAZARD SAFE DEVICE!

Refer to Instruction No. I-205-2R1, INSTRUCTIONS FOR BLUE M "ONE PASS" AIR FLOW SYSTEM, for details of this feature.

CAUTION

ALWAYS TURN OFF MAIN DISCONNECT SWITCH BEFORE ENTERING WIRING COMPARTMENT.

III. PLACING UNIT IN OPERATION

1. Place main switch in Off position.

2. Set main controller and OTP controller setpoints to desired levels (OTP is normally set 10C above main controller setpoint).

3. Place main switch in On position. If control failure pilot lamp lights, depress OTP reset switch to start unit. (Switch may have been tripped by vibration during transit.)

4. Allow oven to stabilize in temperature at desired set point and adjust one pass air flow dampers for optimum performance (see ONE-PASS AIR FLOW SYSTEM I-205-2R1 in your instruction package).

IV. MAINTENANCE

CAUTION

DISCONNECT POWER TO UNIT BEFORE ATTEMPTING TO SERVICE OVEN

1. LUBRICATION -- Units have direct drive blower wheels and require no lubrication.

2. CALIBRATION -- Periodically, temperature controller performance should be checked by using an independent thermal testing device. Controller comes fully adjusted and calibrated by manufacturer. There should be no need for customer involvement with alignment procedures. User adjustment is especially inadvisable during controller's warranty period. However, should there be serious question of meter's calibration, follow these instructions carefully.

NOTE: A millivolt (mV) power supply source is needed for this calibration procedure.

a. Plug test leads into mV source outputs observing proper polarity.

b. Set mV source output for 000.00mV for zero output.

c. Connect negative test lead to TP-1 (test point one) on UE D931 circuit board and positive test lead to TP-2.

d. Turn P1 pot (potentiometer) so that UE D931 meter displays a reading of 0.

e. Set mV output for 950.00 mV.

f. Turn P2 pot so that UE D931 meter displays a reading of 950 degrees.

3. CLEANING -- Periodically, clean inside of control compartment and blower wheel/heating element compartment using a high pressure air hose. Clean chamber interior with damp cloth and mild dishwashing detergent. Rinse thoroughly after cleaning.

4. OTP TESTING -- For continued safety, OTP circuit should be tested periodically. Set OTP control at a lower temperature than temperature at which unit is set to operate. Run unit in normal operation. If OTP circuit is performing properly unit should shut down once chamber temperature goes higher than OTP setpoint temperature. OTP reset switch will restore unit to operation. Don't forget to reset OTP control 10 degrees higher than unit's normal operating temperature.

5. ELEMENT REPLACEMENT

CAUTION

DISCONNECT POWER TO UNIT!

a. FLOOR & BENCH MODELS

Remove back panel of control compartment and disconnect element leads from element terminal block(s).

Open chamber door and unscrew and remove plenum floor. (Some units may require the removal of the lower shelf mounts to provide clearance.)

Pull element leads into main chamber area. Remove element(s) from brackets.

Replacement is the reverse of the above steps.

b. BATCH MODELS

Remove dust cover from top of unit to access element terminals. Disconnect electrical connections to terminals and straighten leads.

Open chamber door and unscrew and remove plenum ceiling panel to access elements. Element may be snapped out of its mounting bracket and leads pulled straight down through bottom ceramic insulator.

Installation of new elements is the reverse.

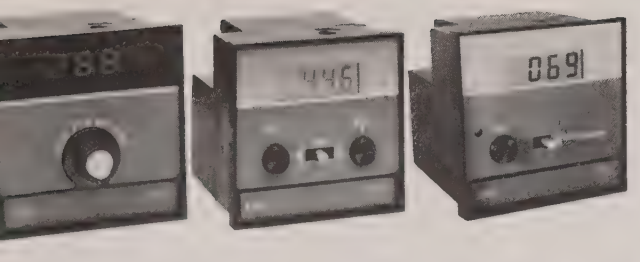
CAUTION

THIS UNIT IS NOT DESIGNED TO PROCESS HAZARDOUS WORK LOADS. FATAL INJURIES AND PROPERTY DAMAGE CAN RESULT FROM PROCESSING COMBUSTIBLE VOLATILE FLUIDS OR MATERIALS WHICH EMIT EXPLOSIVE VAPORS. SEE INSTRUCTION I-303-37

CAUTION

THIS UNIT INCLUDES MANY SAFETY FEATURES, INCORPORATES COMPONENTS AND MATERIALS DESIGNED FOR SPECIFIC NEEDS. ANY MODIFICATION OF THIS EQUIPMENT MAY CAUSE SERIOUS SAFETY HAZARD.

RH:1/2/86



D931 D932 D934

INSTALLATION AND MAINTENANCE INSTRUCTIONS

TYPES D931, D932 & D934

SINGLE AND DUAL OUTPUT CONTROLLERS

D930-4

7M MAP 1185

PART I. MOUNTING

WARNING: Always mount controller away from shock, vibration, moisture and dust. Locate where there is sufficient space for access to wiring terminals on back of enclosure and where ambient temperature remains between 32° and 130°F.

PANEL MOUNTING

PANEL CUTOUT: 92mm sq. (3.622)

Referring to Diagram 1, place enclosure, with face plate oriented upright, into panel. Place mounting clamps into slots at top and bottom of enclosure (Diagram 2). Using a 3/16 flat tip screwdriver, turn top clamp left and bottom clamp right to lock unit into position. Tighten screws against panel. Unit is now ready for wiring. If wiring space is restricted, wire controller first, then mount.

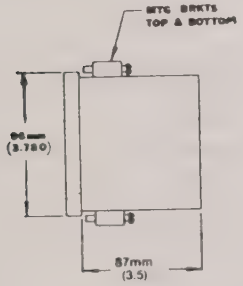


Diagram 1

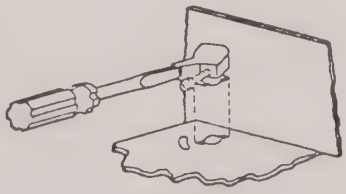


Diagram 2

PART II. WIRING

A. LINE VOLTAGE CONNECTIONS

WARNING: Wire controllers to comply with local and national electrical codes. Use wire sizes #18, #16 and #14 only. Observe markings for the terminals; incorrect wiring can damage the controller. Line voltage power leads must be connected to proper terminals, as listed below. Disconnect all power before connecting wires to terminals.

IMPORTANT: Typical power for types D931, D932 and D934 is 7 VA (instrument). External fusing is recommended.

Connect line voltage power leads as follows:

Type D931. Connect leads to terminals 1 & 2. 2 & 3 for 230 VAC (See Diagram 3).

Type D932. Connect supply voltage leads to terminals 1 & 2. (See Diagram 4 and check designation label on controller for correct voltage).

Type D934. Connect supply voltage leads to terminals 1 & 2. (See Diagram 5 and check designation label on controller for correct voltage).

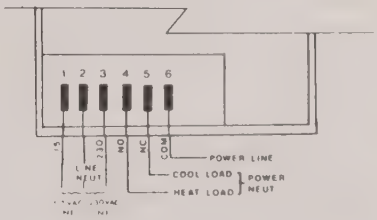


Diagram 3. D931

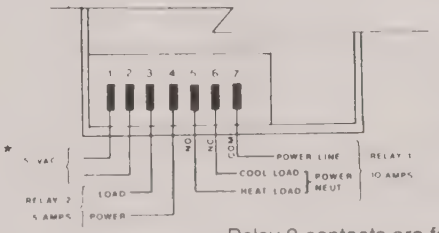


Diagram 4. D932

Relay 2 contacts are factory COM, N.O.

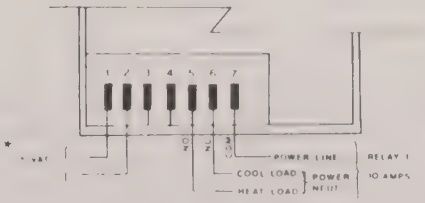


Diagram 5. D934

*230 VAC if option E510 appears on designation label.

B. SENSOR (INPUT) CONNECTIONS

CAUTION: Do not run sensor leads through same conduit or wireway with power or load leads.

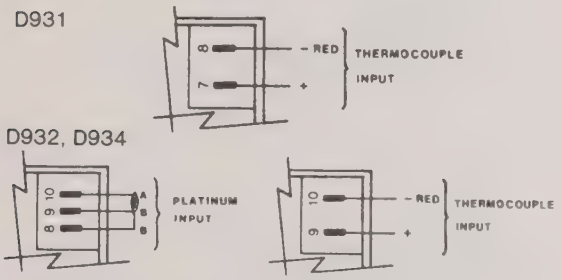
UNITED ELECTRIC CONTROLS COMPANY
85 SCHOOL STREET • WATERTOWN • MASS. 02172 • U.S.A. • 617/926-1000 TELEX: 092-2445

THERMOCOUPLE TYPE J (D931) TYPES J & K (D932 & D934)
—Thermocouple upscale protection for open thermocouple is standard.
—Always use thermocouple extension wire and connector matching thermocouple calibration.
—Thermocouple lead wire and extension wire are color coded. The negative (-) lead is red. The positive (+) lead is white for Type J and yellow for Type K.
—Always use .25 Faston female terminals for sensor input terminal connections.
—To compute total thermocouple error in OHMS, select wire gauge and thermocouple calibration and multiply total length of leadwire by value shown in table below. Divide by 100 to compute total setting and indicating error in ºF.

	Wire Gauge					
	20(Std)	12	14	16	18	24
J	.357	.054	.087	137	.222	.878
K	.586	.091	.146	.230	.374	1.490

100 OHM Platinum RTD 3-Wire D932 & D934 Always use equal lengths of extension wire. Always use .25" Faston female terminals for sensor input terminal connections.

Connect sensor (input) leads as follows:



C. LOAD CONNECTIONS

WARNING: Power must not be applied directly between common and heat (N.O.) or common and cool (N.C.). Such connections place the power directly across the relay contacts and will permanently damage the controller. The heat and cool terminals must be connected to the appropriate loads before being connected to the load power line.

NOTE: Relay(s) are energized below set point(s). Pilot light 1 is "on below set point 1, and pilot light 2 is "on above set point 2.

For standard units, connect load lines as in Diagram 3 (D931), Diagram 4 (D932) or Diagram 5 (D934).

For units with options, make wiring connections as shown in following diagrams.

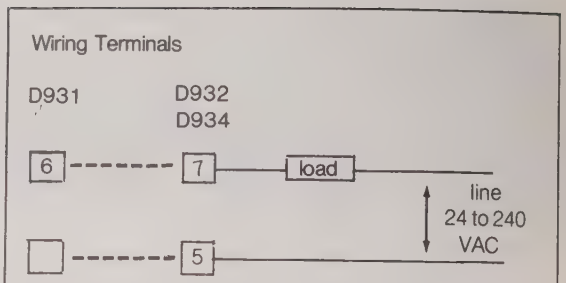


Diagram 6. 1.5 Solid State Relay Option

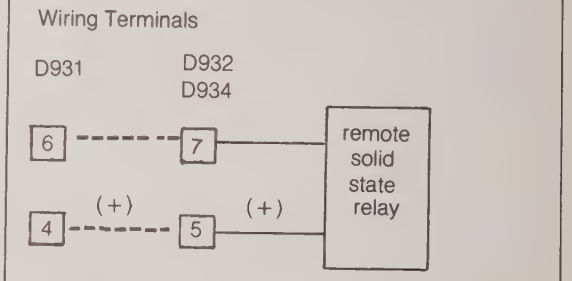


Diagram 7. 0-24 VDC Logic Option

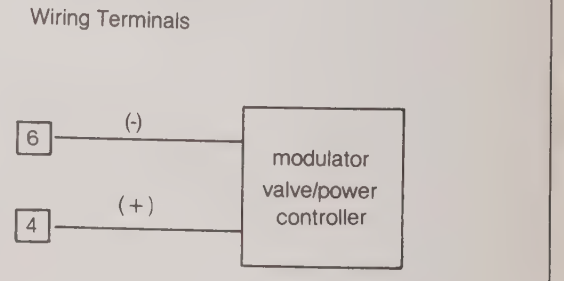


Diagram (8) 4-20 mA Option

CAUTION: Using non-isolated 4-20 mA with non-isolated load can result in shock hazard.

NOTE: Maximum load impedance 750 OHMS.

D. MOLEX CONNECTOR OPTION

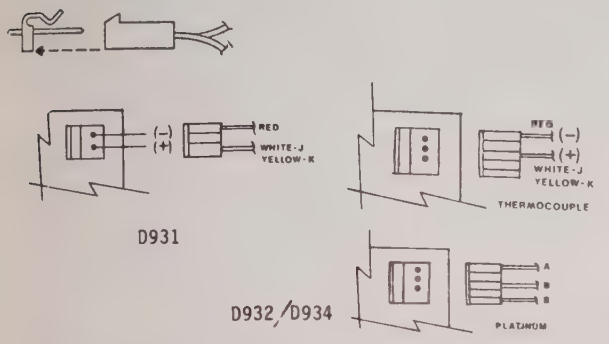
D931
2 Molex terminals (#08-56-0106)
6 Molex terminals (#08-50-0106)
1 Molex connector (#09-50-3031)
1 Molex connector (#09-50-3111)

D932/D934

3 Molex terminals (#08-56-0106)
7 Molex terminals (#08-50-0106)
1 Molex connector (#09-50-3051)
1 Molex connector (#09-50-3131)

Construct Molex harness as follows:

a. Notice that the male and female connectors are polarized and only snap together and lock in place when oriented in one direction. Control may be permanently damaged if connectors are not properly inserted.



b. Decide which control terminals are to be wired by referring to the labels on the P.C. board or Diagrams 3-8).

c. Crimp 2 or 3 gold terminals (#08-56-0106) to the sensor leadwires using a hand tool made by Molex or AMP. Snap leads into the proper positions of 5 position Molex connector (See Diagram above).

d. Crimp 6 or 7 remaining terminals to lead wires and insert into positions in the female connector opposite the chosen terminals.

PART III. ADJUSTMENTS

A. CONTROLLER SET POINT ADJUSTMENT

D931
Push in and turn potentiometer knob. The set point temperature will appear on the display. When the knob is released, the display will revert to indicating the process temperature.

D932
Set Point #1. With the Push-to-Read switch to the left, turn set point 1 thumb knob clockwise to raise set point, counterclockwise to lower set point. Set Point #2. With the Push-to-Read switch to the right, turn set point 2 thumb knob clockwise to raise set point and counterclockwise to lower set point.

D934
With the Push-to-Read switch to the left, turn thumb knob clockwise to raise set point, counterclockwise to lower set point.

B. CONTROL MODE ADJUSTMENTS

IMPORTANT: Do not use excessive force when adjusting trimpots.

1. SET POINT # 1

a. Models With Time Proportioning Mode (Standard)

Controls are factory set for on-off mode but may be converted to time proportioning operation by turning the bandwidth and cycle time adjustments. 9

Bandwidth—is the symmetrical region around set point within which proportioning action occurs. Bandwidth may be adjusted from .25 to 10% of range span. Turning the adjustment clockwise increases the bandwidth.

Cycle Time—is the time, in seconds, for the control to complete one on-off cycle. Cycle time may be adjusted from approximately 2 to 36 seconds. Turning the adjustment screw counterclockwise increases the cycle time (reduces the cycling rate). The cycle time value is dependent on the bandwidth value chosen and should be adjusted after the bandwidth adjustment is made. It also varies with process temperature and is at maximum when temperature is at set point (center of bandwidth).

Coarse & Fine Manual Reset Adjustments—allow an operator to eliminate thermal offset or droop, which is the difference between set point and where temperature stabilizes. Droop is normal when using a proportioning mode.

Tuning a Time Proportioning Control to a System:

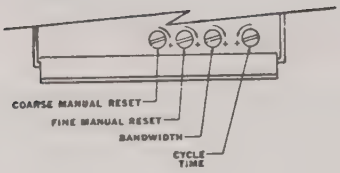
1. Set the controller for on-off operation (Bandwidth fully counterclockwise, Cycle Time fully clockwise). Do not touch the Manual Reset adjustments since they have been factory adjusted (calibrated) to make relay de-energize at set point.
2. Allow temperature to come up to set point and stabilize. Note amount of overshoot and width of sawtooth swings (closeness of control). If these are acceptable then go no further.
3. If closer control or less initial overshoot is desired, convert to Time Proportioning by turning the Bandwidth adjustment clockwise 1/4 without saw tooth swings.
4. Start up the system again. If amount of overshoot is still unacceptable, turn Bandwidth fully clockwise.
5. If even closer control or less overshoot is desired, the D931 may be ordered with the burst proportioning options E106 24 VDC logic option E113 1.5 Amp Solid State Relay .
E106) with external solid state relay. (D931 only).
6. When using 10 AMP mechanical relay, if longer relay life is desired, increase cycle time by turning adjustment counterclockwise 1/8 turn.
7. If temperature stabilizes below set point due to droop, turn appropriate Manual Reset adjustment clockwise 1/8 turn. Temperature should then stabilize at or closer to set point. Turn adjustment screw counterclockwise if temperature stabilizes above set point.(B

b. Models With On-Off Mode (Option E101)

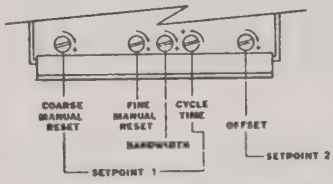
Controls are factory set for on-off operation, with differential from relay "on to relay "off approximately .25% of range span. No adjustment is neccessary unless the setting temperature is not in the center of the on-off sawtooth cycle when process temperature has stabilized. If

setting is not in center, the Manual Reset Adjustments (See Diagrams below) may be turned slightly to make the temperature agree—only at that specific set point. Turning reset adjustments may adversely affect calibration accuracy at other set points! The Coarse Manual Reset (adjustable up to 10% of range) should be used to bring temperature close to set point. The Fine Manual Reset (adjustable up to 1/of range) should then be used for a more accurate adjustment.

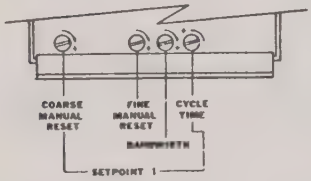
D931



D932



D934



c. Models With 4-20 mA (Option E104, D931 only)

Turn the Cycle Time adjustment fully clockwise. The Bandwidth set pot can then be adjusted to obtain the desired bandwidth. The typical output is 20 mA at beginning of bandwidth below set point, and 4 mA at upper end of band above set point. Set point is approximately 12 mA.

The non-isolated 4-20 mA is recommended for low voltage loads, or loads that have their own isolation. (Observe wiring Diagram 8).

When using 4-20 mA output, to convert to 1-5 VDC put 1/4 watt 250 OHM resistor across lead input terminals. (See Diagram 8).

d. Models With Burst Proportioning (Option E106, E113 and D931 only)

Cycle time is typically .2 to 3.6 seconds instead of 2 to 36 seconds on standard time proportioning controllers. To adjust, follow procedure outlined in PART III, Section B. Burst proportioning option available only with remote solid state relay and logic output 0-24 VDC.

2. SET POINT # 2 (D932 only)

a. Models With On-Off Mode, Independent Setting (Standard)

Controls are factory set for on-off operation, with relay energized below set point. Green pilot light is visable through window and "on above set point. Independent adjustment is allowed over full span, and an "offset pot under the flip-up door allows an operator 10% of full span adjustment to provide maximum second set point accuracy at one specific set point within the range span. Turning the offset adjustment may adversely affect calibration accuracy at other set points!

b. Models With High Limit Mode With Manual Reset Switch (Option L63)

This mode has a manual reset switch that locks out on rising temperature and can be reset after temperature falls. Green pilot light is on above set point. Independent adjustment can be accomplished by inserting screwdriver into grommeted screw slot and turning clockwise to raise, counterclockwise to lower set point. Supply voltage is maintained at + 10%, −15%.

c. Models With On-Off Mode, Tracking Setting (Option E212)
Secondary output tracks primary output with separation up to 18% full span. Actual setting temperature is visable on the display. Adjustment can be accomplished by inserting screwdriver into grommeted screw slot and turning clockwise to raise, counterclockwise to lower set point.

PART IV. CONTROLLER SERVICING

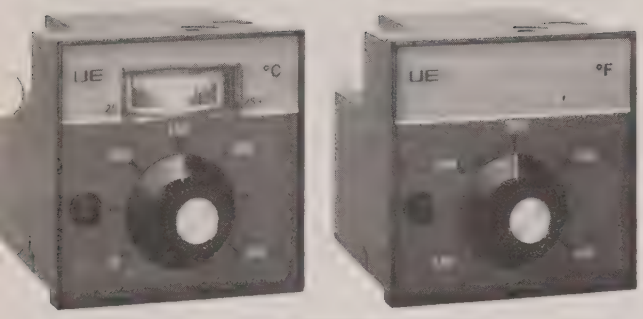
A. Should malfunction occur, return controller to factory, authorized distributor, or repair depot.

B. Replacing the Relay:

1. Remove wire restraining clip by sliding it to either side until it releases.
2. Pull straight out on top section of relay until it unplugs. Plug in new relay.
3. Replace restraining wire clip by hooking ends under grooves on opposite sides of base and sliding wire over top of relay.

United Electric Controls Company recommends careful consideration of the following factors when specifying and installing temperature products. Always refer to the Installation and Maintenance instructions for individual products for specific recommendations prior to installation.

- Install a back-up control for all critical applications where a misapplication of a control could endager life, limb or property. A back-up control to serve as a high or low limit control is especially recommended for applications where a temperature runaway condition could result
- Provide for preventative maintenance and periodic testing — particularly in critical applications.
- Install units away from shock and vibration, and orient so moisture is prevented from entering the enclosure. Proper electrical fittings should be used to prevent moisture entering the enclosure.
- Do not mount in ambient temperatures exceeding published limits.
- Electrical ratings stated in literature and on nameplates should not be exceeded. Overload on a control relay can significantly reduce control life. Always wire devices to national and local electrical codes, using wire sizes recommended in UE literature.
- Note warning signs such as drift in set point or indication. Check controls immediately.
- Perform internal adjustments and wiring only as recommended
- Observe polarity for all plug-in components.
- Protect solid state and mechanical output relays from overload by use of properly rated external fusing.
- The use of any relay output beyond its published limits for current, voltage or life could result in permanent control damage. Consult factory as needed
- A solid state relay is recommended for time proportioning models with cycle times faster than 20 seconds
- Long lead wires between sensor and control head can introduce error factors. Recalibrate as needed
- Extension wire for thermocouples must match the original sensor type.
- All sensors are non-submersible and must be used with compression fitting or well in a fluid medium
- Temperature to which sensor is subjected should not exceed maximum process temperature rating of sensor



INSTALLATION AND MAINTENANCE INSTRUCTIONS

TYPES E931, N931 & E935

SOLID STATE TEMPERATURE CONTROLS

IM-930-3

PART I. MOUNTING

WARNING: Always mount controller away from shock, vibration, moisture and dust. Locate where there is sufficient space for access to wiring terminals on back of enclosure and where ambient temperature remains between 32° and 130°F.

PANEL MOUNTING

PANEL CUTOUT: 92mm sq. (3.622)

Types E931 & N931

Referring to Diagram 1, place enclosure, with face plate oriented upright, into panel. Place mounting clamps into slots at top and bottom of enclosure (Diagram 2). Using a 3/16" flat tip screwdriver, turn top clamp left and bottom clamp right to lock unit into position. Tighten screws against panel. Unit is now ready for wiring. If wiring space is restricted, wire controller first, then mount.

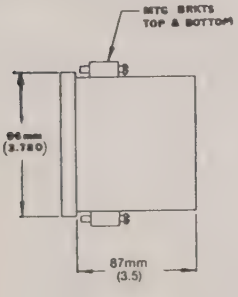


DIAGRAM 1

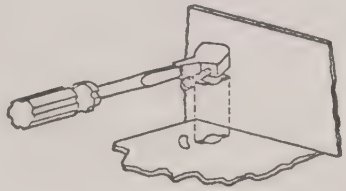


DIAGRAM 2

Type E935

Mount P.C. board using three plastic or nylon screws and spacers (See Diagram 3). Mount remote setting potentiometer through 3/8" clearance hole with (2) nuts provided (See Diagram 4 for potentiometer lead connections). Remove adhesive backing from dial and carefully center over nut.

To calibrate dial: subject sensor to a known temperature, turn potentiometer until relay actuates, put knob on shaft with reference line on known temperature, and tighten knob set screw.

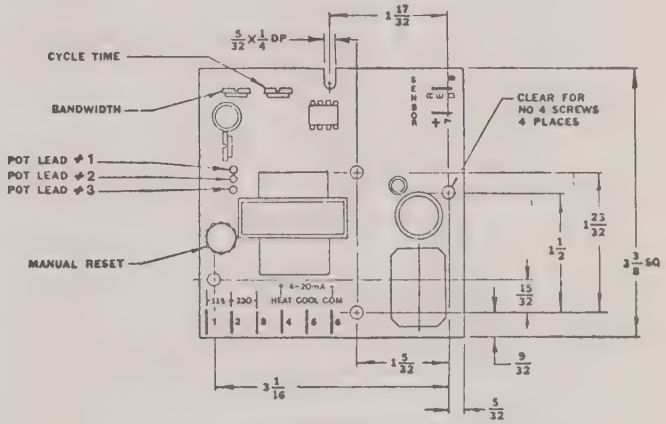


DIAGRAM 3

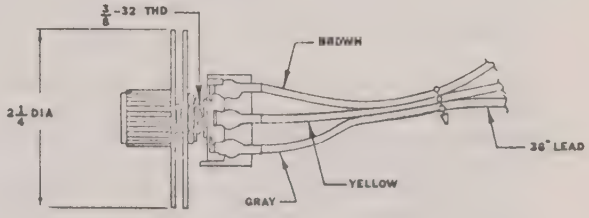


DIAGRAM 4

Pot Lead Connections (E935 only)

Thermistor sensor		Thermocouple sensor
Gray	POT LEAD #1	Brown
Yellow	POT LEAD #2	Gray
Brown	POT LEAD #3	Yellow

PART II. WIRING

A. LINE VOLTAGE CONNECTIONS

WARNING: Wire controllers to comply with local and national electrical codes. Use wire sizes #18, #16 and #14 only. Observe markings for the terminals; incorrect wiring can damage the controller. Line voltage power leads must be connected to proper terminals, as listed below.

Disconnect all power before connecting wires to control terminals.

IMPORTANT: Typical power for types E931, N931 and E935 is 7.5 watts. External fusing is recommended

Connect line voltage power leads as follows:

Connect leads to terminals 1 & 2 for 115 VAC or terminals 2 & 3 for 230 VAC (See Diagram 5).

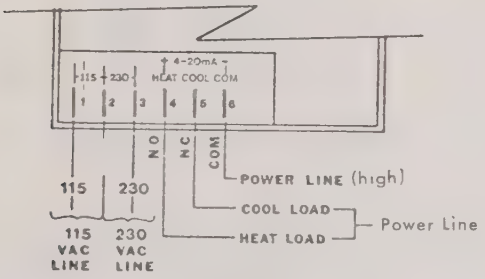


DIAGRAM 5

B. SENSOR (INPUT) CONNECTIONS

CAUTION: Do not run sensor leads through same conduit or wireway with power or load leads.

THERMOCOUPLE TYPES

- Thermocouple upscale protection for open thermocouple is standard.
- Always use thermocouple extension wire and connector matching thermocouple calibration.
- Thermocouple lead wire and extension wire are color coded. The negative (-) lead is red. The positive (+) lead is white for type J and yellow for type K.

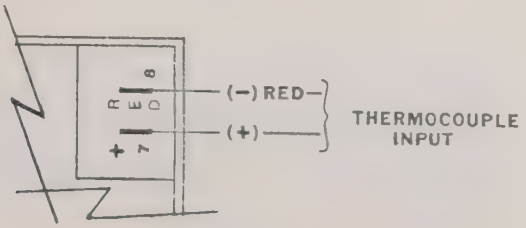


DIAGRAM 5A
Thermocouple wiring

- Always use .25" Faston female terminals for sensor input terminal connections.
- To compute total thermocouple error in OHMS, select wire guage and thermocouple calibration and multiply total length of leadwire by value shown in table below. Divide by 100 to compute total setting and indicating error in °F.

	Wire Gauge					
	20(Std)	12	14	16	18	24
J	.357	.054	.087	.137	.222	.878
K	.586	.091	.146	.230	.374	1.490

Table 1 - Thermocouple lead length errors

THERMISTOR TYPES

- Failsafe protection for heating applications is standard.
- 100,000 ohms at 25°C for 150 to 450°F range. 10,000 ohms at 25°C for 0 to 250°F range.
- When connecting sensor (input) leads, disregard polarity for thermistor sensor.

C. LOAD CONNECTIONS

WARNING: Power must not be applied directly between common and heat (N.O.) or common and cool (N.C.). Such connections place the power directly across the relay contacts and will permanately damage the controller. The heat and cool terminals must be connected to the appropriate loads before being connected to the load power line.

NOTE: Relay is energized (pilot light is on) below set point.

For standard units, connect load lines as in Diagram 5.

For units with options, make wiring connections per appropriate Diagram below:

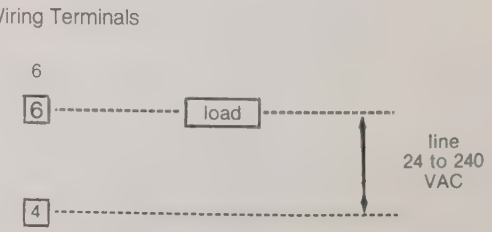


DIAGRAM 6. 1.5 Amp Solid State Relay Option

Wiring Terminals

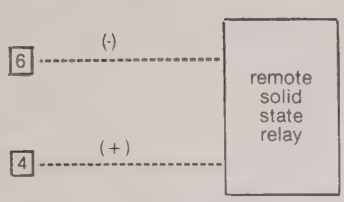


DIAGRAM 7. 0-24 VDC Logic Option

Wiring Terminals

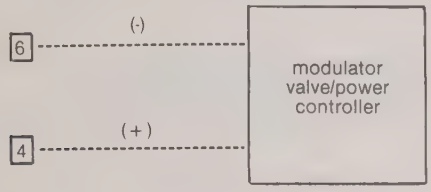


DIAGRAM 8. 4-20 mA Option

CAUTION: Using non-isolated 4-20 mA with non-isolated load can result in shock hazard.

NOTE: Maximum load impedance 750 OHMS.

D. MOLEX CONNECTOR (Option E505)

Supplied: 2 Molex terminals (#08-56-0106)
7 Molex terminals (#08-50-0106)
1 Molex connector (#09-50-3111)
1 Molex connector (#09-50-3031)

Construct Molex harness as follows:

a. Notice that the male and female connectors are polarized and only snap together and lock in place when oriented in one direction. Control may be permanently damaged if connectors are not properly inserted.

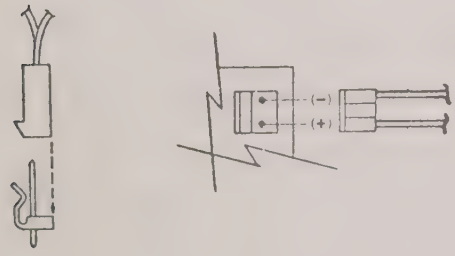


DIAGRAM 9 - Molex connector option

b. Decide which control terminals are to be wired by refering to the lables on the P.C. board.
c. Crimp 2 gold terminals (#08-56-0106) to the sensor leadwires using a hand tool made by Molex or AMP. Snap leads into outer positions of 3 position. Molex connector (See Diagram 9). Red thermocouple wire goes to (-) terminal. With thermistor, disregard polarity.
d. Crimp 6 remaining terminals to lead wires and insert into positions in the female connector opposite the chosen control terminals.

PART III. ADJUSTMENTS

CONTROL MODE ADJUSTMENTS

IMPORTANT: Do not use excessive force when adjusting trimpots, due to single turn adjustment.

NOTE: Refer to Diagram 3 for location of manual reset adjustment on E935 and for bandwidth and cycle time adjustments on all controls.

WARNING: The manual reset adjustment has been factory set. Adjustment may be made to acheive better accuracy at one point in the range. This will adversely affect calibration at other points in the range.

1. Models With Time Proportioning Mode (Standard)

Controls are factory set for on-off mode but may be converted to time proportioning operation by turning the bandwidth and cycle time adjustments.

Bandwidth — is the symmetrical region around set point within which proportioning action occurs. Bandwidth may be adjusted from .25 to 10% of range span. Turning the adjustment clockwise increases the bandwidth.

Cycle Time — is the time, in seconds, for the control to complete one on-off cycle. Cycle time may be adjusted from approximately 2 to 36 seconds. Turning the adjustment screw counterclockwise increases the cycle time (reduces the cycling rate). The cycle time value is dependent on the bandwidth value chosen and should be adjusted after the bandwidth adjustment is made. It also varies with process temperature and is at maximum when temperature is at set point (center of bandwidth).

Manual Reset Adjustment — allows an operator to eliminate thermal "offset" or "droop," which is the difference between set point and where temperature stabilizes. Droop is normal when using a proportioning mode.

Tuning a Time Proportioning Control to a System:

a. Set the controller for on-off operation (Bandwidth fully counterclockwise, Cycle Time fully clockwise). Do not touch the Manual Reset adjustment since it has been factory adjusted (calibrated) to make relay de-energize at set point.

b. Allow temperature to come up to set point and stabilize. Note amount of overshoot and width of "sawtooth" swings (closeness of control). If these are acceptable then go no further.

c. If closer control or less initial overshoot is desired, convert to Time Proportioning by turning the Bandwidth adjustment clockwise 1/4 turn. This should result in closer control without sawtooth swings.

d. Start up the system again. If amount of overshoot is still unacceptable, turn Bandwidth fully clockwise.

e. If even closer control or less overshoot is desired, convert to burst proportioning (option E106).

f. When using 10 AMP mechanical relay, if longer relay life is desired, increase cycle time by turning adjustment counterclockwise 1/8 turn.

g. If temperature stabilizes below set point due to "droop," turn Manual Reset Adjustment slightly clockwise (E931, N931) or counterclockwise (E935). Temperature should then stabilize at or closer to set point. If temperature stabilizes above set point, turn Manual Reset Adjustment in opposite direction.

2. Models With On-Off Mode (Option E101)

Controls are factory set for on-off operation, with differential from relay "on" to relay "off" approximately .25% of range span. No adjustment is neccessary unless the setting temperature is not in the center of the on-off "sawtooth" cycle when process temperature has stabilized. If setting is not in center, the Manual Reset Adjustment may be turned slightly to make the temperature agree. This will adversely affect accuracy at other points in the range.

3. Models With On-Off High Limit Mode (Option A65)

Controls have a manual reset switch which latches the relay and a red light comes on when temperature exceeds set point. Switch can be reset when temperature falls. When power is restored following an interruption, the reset switch returns to the state it was in prior to the interruption.

4. Models With 4-20 mA (Option E608)

Turn the Cycle Time adjustment fully clockwise. The Bandwidth set pot can then be adjusted to obtain the desired bandwidth (adjustable from .25 to 8% of range span). The typical output is 20 mA at beginning of bandwidth below set point, and 4 mA at upper end of band above set point. Set point is approximately 12 mA.

NOTE: The current level may rise above 20mA and drop below 4mA at the range extremes.

The non-isolated 4-20 mA is recommended for low voltage loads, or loads that have their own isolation. (See wiring DIAGRAM 8)

When using 4-20 mA output, to convert to 1-5 VDC place a 1/4 watt 250 OHM resistor across lead input terminals. (See DIAGRAM 8)

5. Models With Burst Proportioning (Option E106)

Cycle time is typically .2 to 3.6 seconds instead of 2 to 36 seconds on standard time proportioning controllers. To adjust, follow procedure outlined in PART III, Section 1. Burst proportioning option available only with remote solid state relay and logic output 0-24 VDC.

PART IV. CONTROLLER SERVICING

A. Should controller not operate properly, return controller to factory, authorized distributor, or repair depot.

B. Replacing the Relay:

1. Remove wire restraining clip by sliding it to either side until it releases.

2. Pull straight out on top section of relay until it unplugs. Plug in new relay.

3. Replace restraining wire clip by hooking ends under grooves on opposite sides of base and sliding wire over top of relay.

RECOMMENDED PRACTICES FOR SELECTING AND INSTALLING UE SOLID STATE TEMPERATURE PRODUCTS

- Unitted Electric Controls Company recommends carful consideration of the following factors when specifying and installing temperature products. Always refer to the Installation and Maintenance instructions for individual products for specific recommendations prior to installation.
- Install a back-up control for all critical applications where a misapplication of a control could endanger life, limb or property. A back-up control to serve as a high or low limit control is especially recommended for applications where a temperature runaway condition could result.
- Provide for preventative maintenance and periodic testing particularly in critical applications.
- Install units away from shock and vibration, and orient so moisture is prevented from entering the enclosure. Proper electrical fittings should be used to prevent moisture from entering the enclosure.
- Do not mount in ambient temperatures exceeding published limits.
- Electrical ratings stated in literature and on nameplates should not be exceeded. Overload on a control relay can significantly reduce control life. Always wire devices to national and local electrical codes, using wire sizes recommended in UE literature.
- Note warning signs such as drift in set point or indication. Check controls immediately.
- Perform internal adjustments and wiring only as recommended.
- Observe polarity for all plug-in components.
- Protect solid state and mechanical output relays from overload by use of property rated external fusing.
- The use of any relay output beyound its published limits for current, voltage or life could result in permanent control damage. Consult factory as needed.

UNITED ELECTRIC CONTROLS COMPANY
85 SCHOOL STREET • WATERTOWN • MASS 02172 • U.S.A. • 617/926-1000
TELEX 92 2445

MAX-SET OVERTEMPERATURE PROTECTION (OTP)

The Blue M Max-Set OTP system is designed to prevent nuisance tripping of an overtemperature circuit. It will cycle On and Off several times before a time delay circuit shuts down unit permanently. Immediate start-up is provided when unit is turned On and is not subject to tripping out on momentary power line failure or during power surges.

I. COMPONENTS

The Max-Set system consists of five basic components:

1. OTP CONTROL

This is an On/Off temperature controller. The controller can be one of many different types: a liquid filled thermostat with reference number scale, or an electronic type with or without digital indicating (readout). Some units use a set of control contacts in a recorder or even control contacts of a digital indicator. The only requirements of this control is that when it senses a set temperature it will open a set of control contacts. In all cases, this system should be completely seperate from main control system. Using its own sensor, power supply, etc., it is fully independent.

2. OTP CONTACTOR

This high power electromechanical relay shuts Off power to heating system. Again, it is independent of the temperature control system, but it is turned On and Off by the OTP control. On some units it may also shut Off air circulating motor or other system functions.

3. TIME DELAY AND RESET DEVICE

This is a normally closed time delay shunt trip circuit breaker. When the resistor on back of it is energized it heats a bi-metal element. If it gets hot enough, its contacts will snap into an open condition, shutting Off system. When it cools it must be pressed to manually reset its contacts to a closed position to complete the circuit, allowing the unit to run again.

4. CONTROL FAILURE PILOT LIGHT (Not furnished on all models.)

Signals that both Time Delay and Reset Device contacts are open. It lights only if chamber temperature is below setpoint that unit should be calling for heat, but it cannot, due to open contacts interrupting the circuit.

5. ALARM BUZZER

Connected across Time Delay Reset Device heater. Whenever OTP Time Delay Reset Device resistor begins heating up, Reset Device alarm will ring.

Here is circuit action which occurs when chamber temperature rises to OTP setpoint:

a. OTP temperature controller contacts open thus interrupting its part of heating circuit.

b. OTP contactor, controlled by OTP temperature controller, opens its contacts, thus interrupting its part of heating circuit.

c. Time Delay Reset Device heater (the OTP resistor) begins heating since its circuit is now completed, allowing current flow, causing it to heat up.

d. Since Alarm Buzzer is connected across Time Delay Reset Device and gets its current there, Alarm Buzzer turns On since it, too, is receiving current. This indicates that temperature is at or above OTP setpoint.

When chamber temperature drops below OTP setpoint, Alarm Buzzer turns Off.

II. SYSTEM OPERATION AND TEST PROCEDURE

1. Set OTP control to a temperature slightly above normal main temperature control setting. Note that on programmed units this must be above the highest programmed temperature.

2. With no load in chamber, set main temperature control to a temperature above usual OTP control setpoint.

3. Observe system as chamber temperature exceeds OTP setpoint.

a. OTP control will actually take over control of chamber by cycling the OTP contactor On and Off.

b. Each time OTP control shuts Off heat to chamber, it will cause alarm to ring and energize heater on Time Delay Reset Device.

c. After several On/Off cycles of OTP control, Time Delay Reset Device will get hot enough to trip open its contacts. Heat can no longer be controlled by OTP control since it is permanently shut Off until Reset Device cools and can be manually reset.

d. After Reset Device shuts Off power to OTP contactor, chamber must cool until OTP control starts to call again for heat. When it does, it shuts Off alarm and energizes control failure light.

e. Chamber is now in a true failure mode and cannot restart until cause of failure is found and corrected.

f. Return Main Control setting to its normal value and press Reset switch to resume operation.

If Max-Set OTP circuitry causes unit to cycle more than several times or only once before completely shutting unit down, check resistor on back of Time Delay and reset Device. When resistor is too close, more heat radiates to bi-metal element and its contacts will open sooner. When resistor is too far away, bi-metal element won't receive enough heat to trip contacts open.

Resistor is usually positioned 3/16" from Time Delay and Reset Device to ensure several OTP cyles.

This important safety feature performs its function only during an overtemperature condition. Therefore, it should be checked as described above at least once every month to be sure it will be ready to prevent a catastrophe if Main Control system should ever fail.

III. PROTECTION OF LIVE ELECTRICAL TEST LOADS

When testing live electrical loads, damage to load may occur if load power supply is not interlocked with OTP. In event of overtemperature condition, power to unit will be shut Off; however, heat generated by test load may be sufficient to cause damage to load and unit. It is suggested that test load power supply be interlocked with OTP to ensure power to load will be cut when OTP trips. Suggested practice is to connect safety interlock coil in parallel with OTP contactor coil.

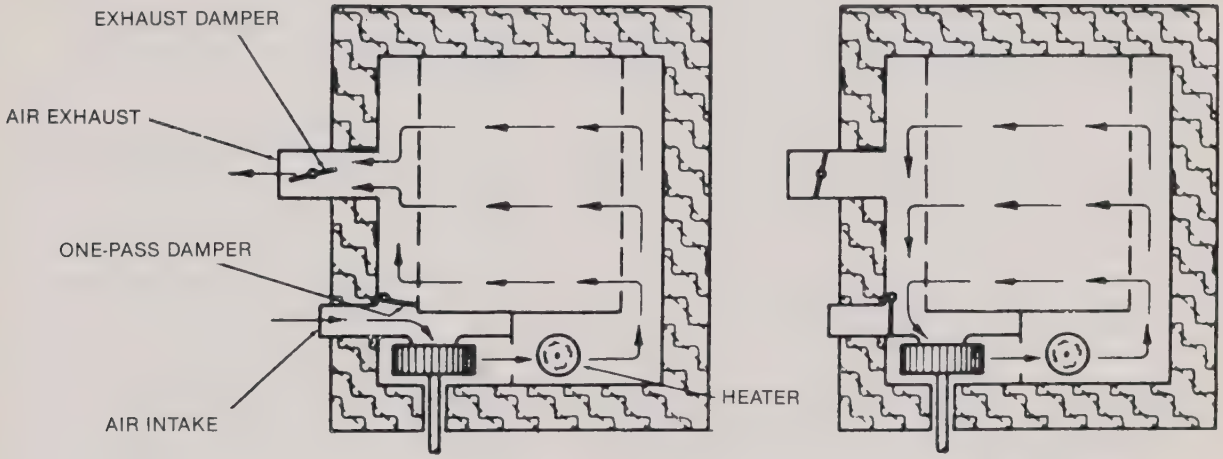
WS/RH: 10/23/85

INSTRUCTIONS FOR BLUE M "ONE PASS" AIR FLOW SYSTEM

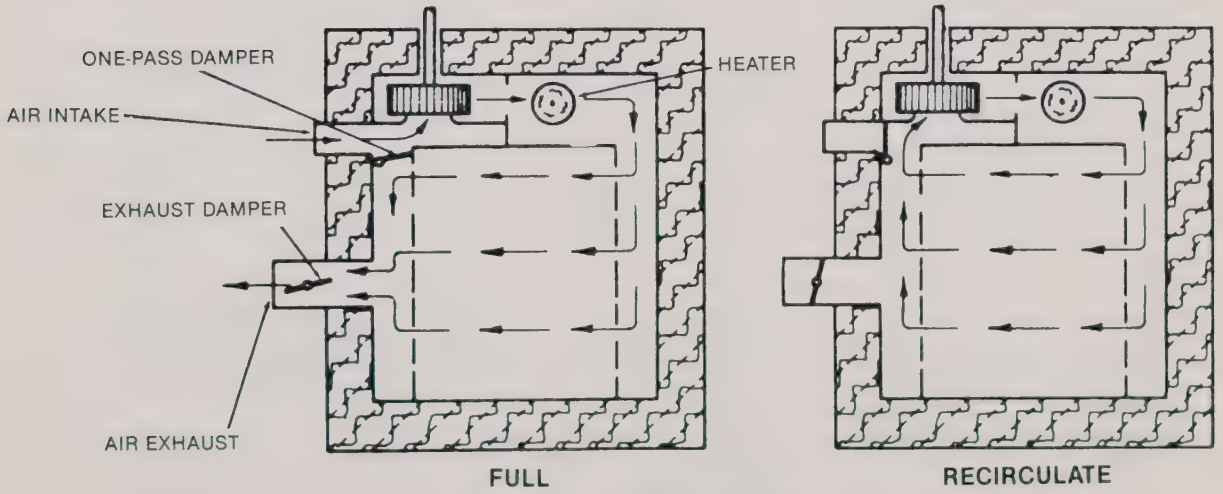
Ovens supplied with one pass air flow have an air intake, air exhaust and recirculating damper installed in the L.H. side. The purpose of this system is to allow oven to operate at low temperatures or exhaust fumes from oven interior. With the damper in the full exhaust position, air enters intake port, passes over heaters, enters oven interior and is exhausted, causing fumes to be exhausted.

Damper is manually adjustable normally from the side of the oven and may be set to full exhaust, recirculate or any position in between. However, there are certain models which are adjusted from the rear.

Moreover, some ovens may have the damper controlled by a drive motor installed on rear of oven. The damper is then controlled by an external device such as a toggle switch, an event relay on a programmer, controller, or an analog signal to provide proportioning action under programmer control.



MECHANICAL CONVECTION OVENS



BATCH TYPE MECHANICAL CONVECTION OVENS

BLUE M
A UNIT OF GENERAL SIGNAL
BLUE ISLAND, ILLINOIS 60406

USE OF AIR INTAKE AND EXHAUST PORTS ON BLUE M OVENS

Standard Blue M Ovens are supplied with intake and exhaust ports. These ports are adjustable to allow varying amounts of air to be drawn into and exhausted from the chamber. Ports should be closed for best results (recirculate) during most heating and baking operations for best temperature uniformity to be maintained. When ports are closed no ambient air is mixed with recirculating chamber air. This is the most economical method of operation since with ports closed, heat loss is minimized, fastest run-up time is obtained and achieving maximum temperature is assured. However, there are four (4) circumstances when it is desirable to open intake and/or exhaust ports. They are as follows:

1. REMOVAL OF EXHAUST VAPORS WHICH RESULT FROM HEATING PROCESSES.

   Most drying operations will be best performed if intake and exhaust ports are opened slightly, or at full exhaust. Vapors will be exhausted to promote faster drying. This technique can be used to eliminate noxious fumes from the oven. In such cases, venting into a forced exhaust system is desirable. WARNING: DO NOT USE THIS UNIT TO PROCESS HAZARDOUS WORK LOADS. HAZARDOUS VOLATILE FLUIDS OR MATERIALS CAN EMIT EXPLOSIVE VAPORS CAUSING PERSONAL INJURY! For further information contact factory.

2. WITH MECHANICALLY CONVECTED OVENS THEY PROVIDE A HEAT LOSS TO MAINTAIN POSITIVE TEMPERATURE CONTROL WHEN OPERATING NEAR AMBIENT TEMPERATURE.

   Mechanically convected ovens are difficult to operate near ambient temperature. Air friction caused by the fan circulating the air within the chamber, causes a heat rise. This heat is not under control of the unit temperature control mechanism. Therefore, at low temperatures, the unit will tend to increase in temperature. This can be minimized by opening both intake and exhaust ports to purge excessive heat from the chamber. As temperatures near ambient, the ports must be opened wider.

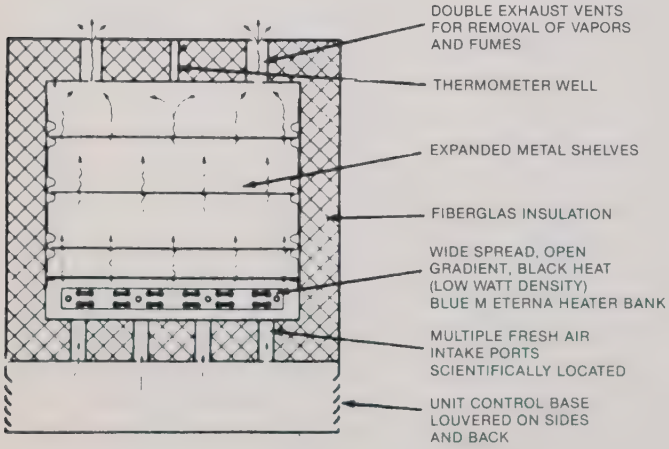
3. PROVIDES SLOW COOL-DOWN OF CHAMBER AND CONTENTS WITHOUT EXCESSIVE HEAT SHOCK.

   Usually when a heating process is completed, there is no problem with opening the door and removing the material from the oven to allow for cooling. In some applications, however, it is more desirable to cool the load gradually. This may be accomplished by turning the temperature control down to its lowest level and opening the intake and exhaust ports to produce desired rate of cool-down required.

4. PROVIDE ENTRANCE OF ELECTRICAL WIRING OR OTHER CONNECTIONS TO THE LOAD DURING HEATING PROCESS.

   When required to make electrical or other connections to a load during a heating process, many standard Blue M units allow the intake or exhaust port to be used. Wiring or the like cannot always take a direct route into the oven chamber. Careful inspection of your unit should be made before this is attempted to insure connections so made will not interfere with normal operation of blower wheel, interior baffles, dampers, heating elements or other components of the oven. When an intake or exhaust port is used for this purpose, the other port must be tightly closed to prevent excessive heat loss. The recommended procedures, however, for entrance of electrical cables, etc., is to provide lead-in-ports at a suitable location, i.e., through top, side walls, or rear wall. This permits both intake and exhaust to be used as planned.

TYPICAL FRONT SECTIONAL VIEW OF A BLUE M GRAVITY CONVECTION UNIT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EXPANDED METAL SHELVES
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MULTIPLE FRESH AIR INTAKE PORTS SCIENTIFICALLY LOCATED
UNIT CONTROL BASE LOUVERED ON SIDES AND BACK

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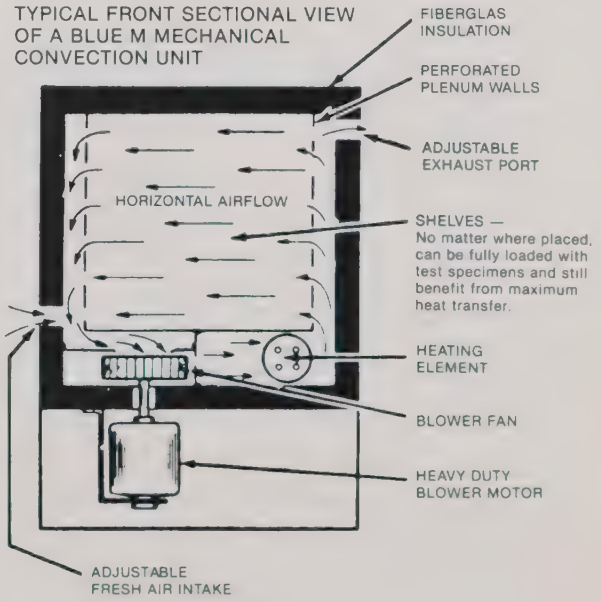
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HORIZONTAL AIRFLOW
SHELVES — No matter where placed, can be fully loaded with test specimens and still benefit from maximum heat transfer.
HEATING ELEMENT
BLOWER FAN
HEAVY DUTY BLOWER MOTOR
ADJUSTABLE FRESH AIR INTAKE

BLUE M
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BLUE ISLAND, ILLINOIS 60406

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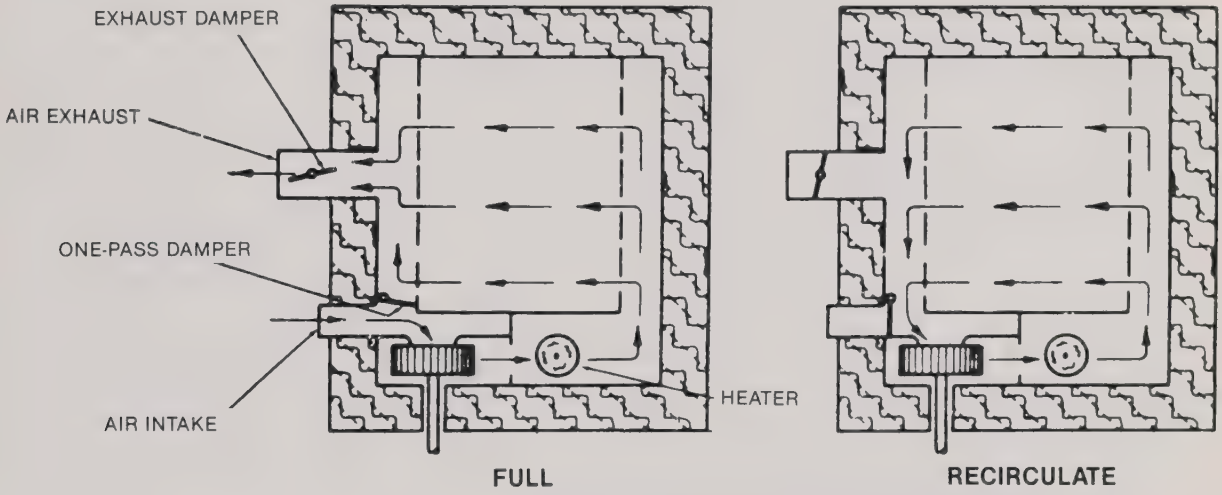
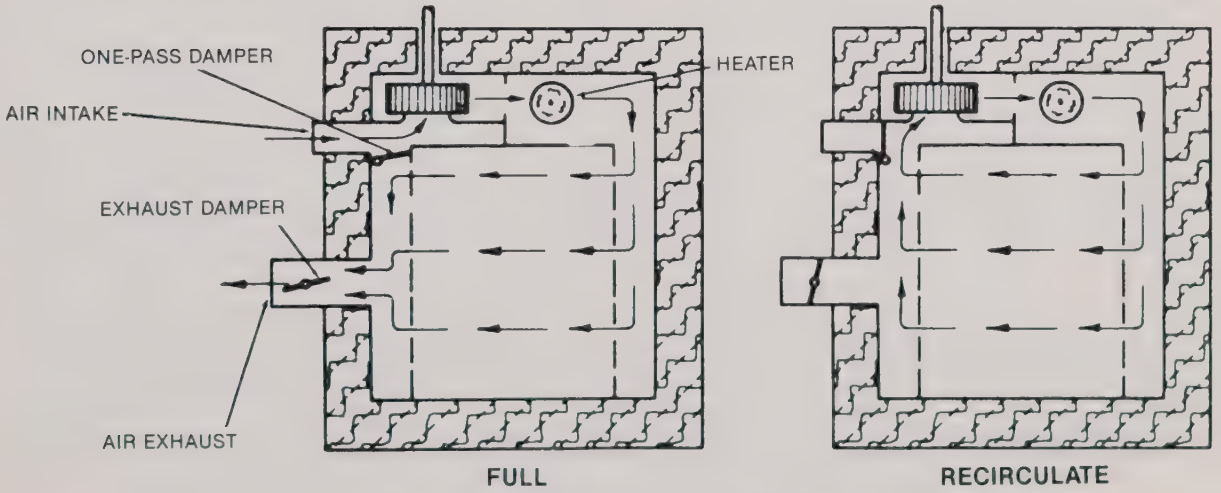


MECHANICAL CONVECTION OVENS



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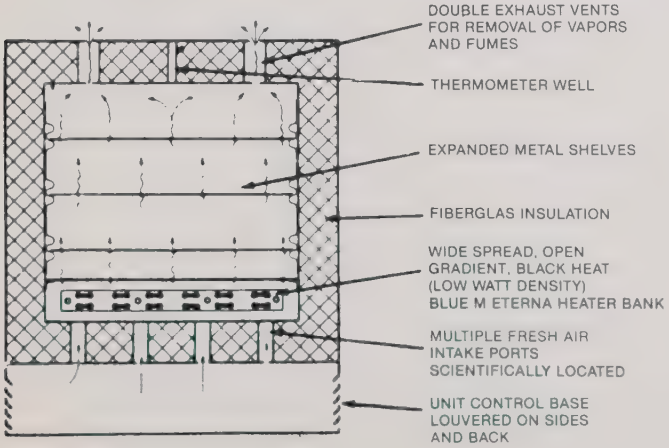
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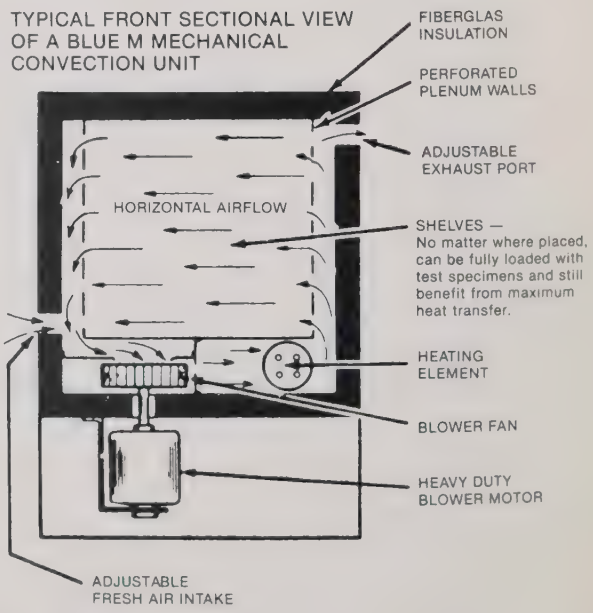
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A UNIT OF GENERAL SIGNAL
BLUE ISLAND, ILLINOIS 60406

BLUE M

A UNIT OF GENERAL SIGNAL

MANUFACTURERS AND ORIGINAL DESIGNERS OF
CONSTANT TEMPERATURE CONTROLLED EQUIPMENT

−150°F. to +3092°F.

- OVENS
- FURNACES
- COLD CHAMBERS
- ENVIRONMENTAL TEST CHAMBERS
- WATER, OIL & REFRIGERATED BATHS
- RELATED EQUIPMENT AND ACCESSORIES

BLUE M

A UNIT OF GENERAL SIGNAL

BLUE ISLAND, ILLINOIS 60406

TELEPHONE: (312) 385-9000 TWX: 910-689-3398

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Printed in U.S.A.
Form W-178-B
ABP-3M-486

1-304-6A

GENERAL BLUE M PARTS WARRANTY AND REPLACEMENT SERVICE PROGRAM

GENERAL BLUE M PARTS WARRANTY AND REPLACEMENT SERVICE PROGRAM

All Blue M equipment is warranted against defective material and workmanship. This warranty varies with the type of equipment sold, but in no instance is it less than one year from date of shipment. All replacement parts will be invoiced and credit issued upon receipt of defective part.

CONTROL INSTRUMENTATION MANUFACTURED BY BLUE M:
WARRANTED 2 YEARS

HEATING ELEMENTS:
WARRANTED 1 or 2 YEARS*

*Depending on unit. However, furnace elements and thermocouples are not warranted because it is impossible to predict the temperature or severity of service to which they will be subjected.

COMMERCIAL INSTRUMENTATION MANUFACTURED BY OTHERS:
WARRANTED 1 YEAR

ALL OTHER COMPONENTS:
WARRANTED 1 YEAR

Our warranty does not cover damage or failure caused by abuse, misuse, abnormal usage, faulty installation, improper maintenance or any repairs other than those provided by authorized Blue M Service Personnel. Blue M will not remove fixturing and/or wiring performed by others in order to perform warranty service.

The foregoing warranties are in lieu of all other warranties expressed or implied, including the guarantees of merchantability or fitness and there are no obligations of liabilities on the part of Blue M for consequential damages arising out of or in conjunction with the use or performance of the product or other indirect damages with respect to loss of use revenues or profit.

There are no warranties which extend beyond the description on the face hereof. The foregoing states our entire liability in respect to our equipment, except such as authorized executive of Blue M may otherwise agree in writing.

The above is a general statement of warranty. Some Blue M Products are covered under individual service and replacement policies. Details on request.

BLUE M MAINTENANCE AGREEMENT PROGRAM:
Blue M has available a flexible Maintenance Agreement Program which covers the periodic inspection and maintenance of our equipment at the user's location.

This economical program is available from a number of Blue M offices located strategically throughout the United States. Please contact the factory for complete information.

WARRANTY REPLACEMENT PARTS ORDERS:

A. All warranty replacement parts must be ordered as warranty replacements, complete with model and serial numbers of units.

B. All replacement parts will be invoiced and credit issued on return of defective parts, if covered by warranty.

C. Blue M will not issue credit for parts used from customer's parts inventory for warranty repairs. We will replace such parts with new parts on return of defective part. The model number and serial number of the unit must be included.

D. Failure to comply with these procedures will relieve Blue M of responsibility to issue credit or replace defective parts under warranty.

Please refer to specific unit warranties for individual and itemized component warranty.

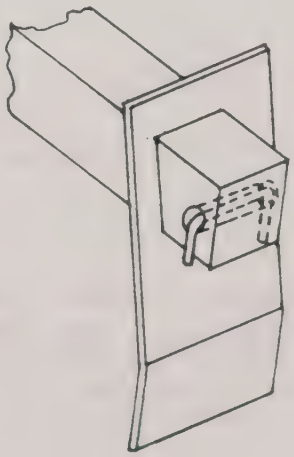
SPECIAL REPLACEMENT INSTRUCTION FOR HEATING ELEMENTS USING 5/16" SQUARE RODS & 4-1/8" DIA. CERAMIC DISKS

NOTICE

This replacement heating element is shipped with a 1/8" hole drilled through both ends of the element rod and two "L" shaped pins (Blue M part number 6B-4933).

The pins are provided to serve as a cotter pin-like lock to secure the element in place in the heating compartment of the chamber after replacement of the heating element.

After the element rod is installed, insert the rod lock through the hole in the bar and bend the straight end over to secure the element rod in place.



INSTRUCTION I 302 15
APRIL, 1982

IMPORTANT!

Refer to the wiring diagram and/or data plate supplied with the operating and maintenance instructions, for line current requirements prior to connecting to switch box or power source.

Good heating element design practice often prohibits effective balancing of all 3 phases.

On certain models, supplying multiple saturable reactors and heating elements to provide a balanced 3 phase load would be impractical and costly.

On other models, the use of power selector switches and auxiliary elements create unbalanced line currents.

BLUE M

A UNIT OF GENERAL SIGNAL

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Printed in U.S.A.

IMPORTANT NOTICE FOR 3 PHASE OVENS

WARNING

BLOWER MUST ROTATE IN THE PROPER DIRECTION TO INSURE EFFICIENCY.

INCORRECT BLOWER ROTATION RESULTS IN A SUBSTANTIAL REDUCTION OF AIR-FLOW.

CHECK FOR CORRECT BLOWER ROTATION WITH BLOWER MOTOR OPERATING. OPEN OVEN DOOR AND NOTE AIR-FLOW AT DISCHARGE POINTS ON RIGHT HAND SIDE OF OVEN INTERIOR. WHEN ROTATION IS CORRECT, RAPID AIR-FLOW CAN BE FELT AT THIS POINT.

IF BLOWER ROTATION IS INCORRECT, REVERSE ANY TWO POWER LINE CONNECTIONS, AND BLOWER ROTATION WILL BE REVERSED.

IF YOU ARE IN DOUBT, CHECK AIR-FLOW WITH POWER LINES CONNECTED BOTH WAYS TO DETERMINE WHICH PRODUCES GREATEST AIR-FLOW.

BLUE M
A UNIT OF GENERAL SIGNAL
BLUE ISLAND, ILLINOIS 60406

BLUE M

BLUE M Electric Company

Corporate Headquarters BLUE ISLAND, ILLINOIS 60406

MPL-205F
MPL-206F

Page of

MODEL NUMBER DC-366 (RI)
VOLTAGE ALL
MAX. TEMPERATURE
MAX. WATTS
INTERIOR DIMENSIONS. 36W x 36D x 48H

*PARTS NOT SHOWN
**OPTIONAL ACCESSORIES

DATE: 8/3/84 BY: JM CHK: DP APP:

Parts shipped F O B Blue Island, Illinois - When ordering parts, give Model No., Serial No., Voltage and Part No.

ITEM	DESCRIPTION	PART NUMBERS	REQ'D
*1	Blower Wheel	M10-A101	1
*2	Blower Shaft Seal	M05-B236	1
**3	Blower Wheel (Stainless Steel)	M10-B105	1
**4	Blower Shaft Extension (Stainless Steel)	M06-H6-2	1
**5	Blower Shaft Seal (Use With Stainless Steel Shaft)	M05-B234	1
*6	Door Hinge	M01-A5	3
*7	Door Latch & Strike Assembly (50-3/4" BAR)	M02-G15	1
*8	Door Gasket	M05-A2-186"	1
9			
*10	Shelf	M04-C304	As Req'd
**11	Shelf (Stainless Steel)	M04-C134	As Req'd
*12	Shelf (Use With Roll-In Rack Units)	M04-C311	As Req'd
**13	Shelf (Stainless Steel) (Use With Roll-In Rack Units)	M04-C128	As Req'd
14			
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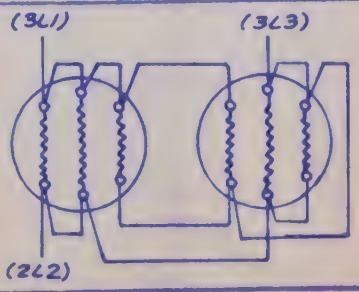
ITEM	DESCRIPTION	PART NUMBERS	REQ'D
OL	Overload Relay-Blower Motor	E11C-4	1
OLH	Overload Heaters-Blower Motor	E11-W41	3
PS	Pressure Switch-Airflow	E16L-1	1
RES	Resistor-OTP	E03A-5-4	1
T	Transformer-Control Circuit (250 VA)	E17B-2-2	1
1T/C	Thermocouple-Main (Type J)	C11B-1-1	1
2T/C	Thermocouple-OTP (Type J)	C11B-1-1	1
TGS	Toggle Switch-Main	E16A-7	1

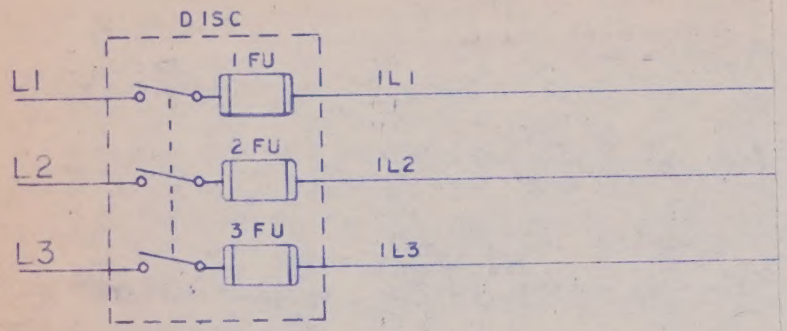
DATE: 8/3/84 BY: JM CHKD: DP APPR: WS

EACH COIL IS 18.2 Ω

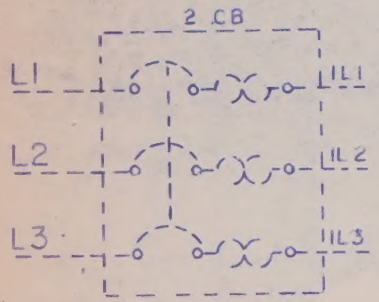
LINE NO.	VOLTAGE	AMPERES
L1	208,240V	42,47A
L2	208,240V	42,47A
L3	208,240V	42,47A

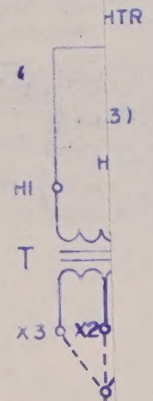


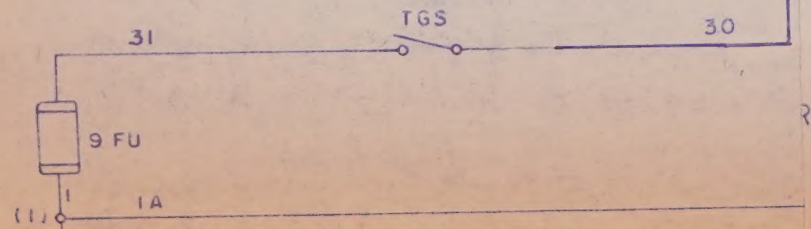
REVISION	REASON	DATE	BY
A	DELETED NOISE SUPPRESSION	8-5-85	GB DP W/S

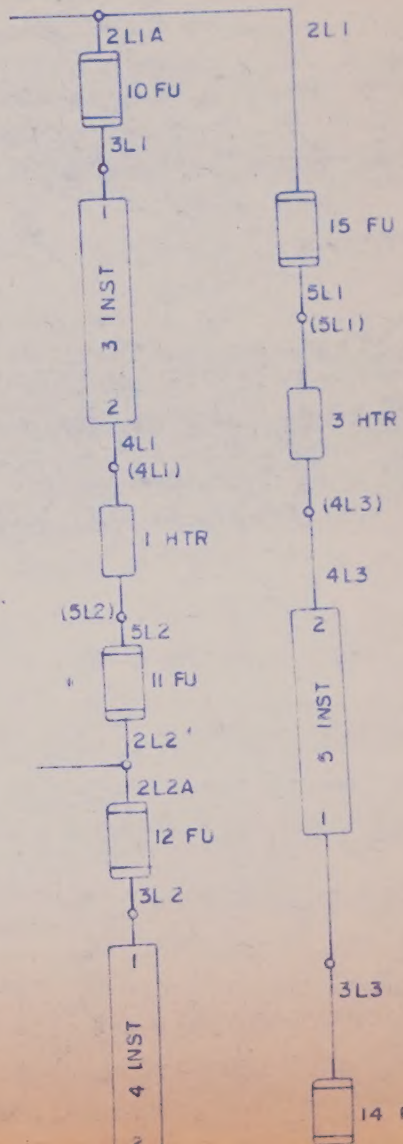


NOTE: 2 CB IS USED ON DCI SERIES INERT GAS OVENS ONLY.









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